

AMENDMENTS TO THE CLAIMS:

Claim 1 (currently amended): A mechanism for causing a flow of liquid crystal comprising:

a channel defined by at least one wall surface;

liquid crystal which is put in the channel and movable along said at least one wall surface;
and

a means for applying an electric or magnetic field to the molecules of the liquid crystal to turn and change positions of said molecules in a plane intersecting said at least one wall surface,

the means including a sub-means for twisting the molecules about an axis intersecting said at least one wall surface and restricting the molecules so that they will turn in one and the same direction,

said restricting means serving to restrict the direction of rotation of those of the molecules which are positioned near said wall surface but not anchored to said wall surface such that, when an electric field or a magnetic is applied and a z-direction is defined as the axial direction of a liquid crystal molecule anchored to said wall surface and projected onto said wall surface, the relative directions of motion from said z-direction of end parts of said molecules rotating around their centers of gravity to move away from said wall surface will coincide with the bulk flow that is generated in said z-direction;

wherein said channel serves to contain said molecules of said liquid crystal therein such that said molecules change positions along wall surfaces that includes said at least one wall surface except those of said molecules that are anchored to said wall surfaces by said restricting means.

Claim 2 (previously presented): The mechanism of claim 1 for causing a flow of liquid crystal wherein:

the channel is defined by a pair of wall surfaces facing each other;

the liquid crystal is put between the paired wall surfaces; and

the sub-means has a pair of orientation films, either of the paired wall surface being fitted

with one orientation film, the surfaces of the orientation films being rubbed in the same direction.

Claim 3 (withdrawn): The mechanism of claim 1 for causing a flow of liquid crystal wherein:

the channel is defined by a pair of wall surfaces facing each other;
the liquid crystal is put between the paired wall surfaces; and
the sub-means has a pair of orientation films, either of the paired wall surface being fitted with one orientation film, the rubbing direction of the surface of one orientation film being at an angle with the rubbing direction of the surface of the other orientation film.

Claim 4 (previously presented): The mechanism of claim 1 for causing a flow of liquid crystal wherein the molecules of the liquid crystal are tilted relatively to the wall surface or one of the paired wall surfaces.

Claim 5 (previously presented): The mechanism of claim 1 for causing a flow of liquid crystal wherein:

the means includes a controller to control the timing in applying an electric or magnetic field to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 6 (previously presented): The mechanism of claim 2 for causing a flow of liquid crystal wherein:

the means includes a controller to control the timing in applying an electric or magnetic field to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 7 (withdrawn): The mechanism of claim 3 for causing a flow of liquid crystal wherein:

the means includes a controller to control the timing in applying an electric or magnetic field

to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 8 (previously presented): The mechanism of claim 4 for causing a flow of
liquid crystal wherein:

the means includes a controller to control the timing in applying an electric or magnetic field
to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 9 (currently amended): An object-moving mechanism comprising:
a fixed lower member;
a movable upper member of which the lower surface faces the upper surface of the fixed
lower member and which is movable along the upper surface of the fixed lower member;
liquid crystal put between the upper surface of the fixed lower member and the lower surface
of the movable upper member; and
a means for applying an electric field to the molecules of the liquid crystal to turn and change
positions of said molecules in a plane intersecting the upper surface of the fixed lower
member,

the means including:

a pair of electrodes, one being fitted to the fixed lower member, the other being fitted to the
movable upper member; and
a sub-means which is fitted onto the fix lower and movable upper members and restricts the
molecules of the liquid crystal so that they will turn in one and the same direction;
said means serving to restrict the direction of rotation of those of the molecules which are
positioned near said wall surface but not anchored to said wall surface such that, when an electric
field or a magnetic is applied and a z-direction is defined as the axial direction of a liquid crystal
molecule anchored to said wall surface and projected onto said wall surface, the relative
directions of motion from said z-direction of end parts of said molecules rotating around their
centers of gravity to move away from said wall surface will coincide with the bulk flow that is
generated in said z-direction;

wherein said sub-means serves to cause those of said molecules of said liquid crystal that are close to said movable upper member to be anchored to said movable upper member, to cause those of said molecules of said liquid crystal that are close to said fixed lower member to be anchored to said fixed lower member, and to restrict those of said molecules of said liquid crystal that are not anchored to said fixed lower member to be movable along said upper surface of said fixed lower member.

Claim 10 (currently amended): An object-moving mechanism comprising:
a fixed lower member;
a movable upper member of which the lower surface faces the upper surface of the fixed lower member and which is movable along the upper surface of the fixed lower member;
liquid crystal put between the upper surface of the fixed lower member and the lower surface of the movable upper member; and
a means for applying a magnetic field to the molecules of the liquid crystal to turn and change positions of said molecules in a plane intersecting the upper surface of the fixed lower member,

the means including:

a pair of magnetic poles, one being fitted to the fixed lower member, the other being fitted to the movable upper member; and
a sub-means which is fitted onto the fix lower and movable upper members and restricts the molecules of the liquid crystal so that they will turn in one and the same direction;
said means serving to restrict the direction of rotation of those of the molecules which are positioned near said wall surface but not anchored to said wall surface such that, when an electric field or a magnetic is applied and a z-direction is defined as the axial direction of a liquid crystal molecule anchored to said wall surface and projected onto said wall surface, the relative directions of motion from said z-direction of end parts of said molecules rotating around their centers of gravity to move away from said wall surface will coincide with the bulk flow that is generated in said z-direction;

wherein said sub-means serves to cause those of said molecules of said liquid crystal that are close to said movable upper member to be anchored to said movable upper member, to cause

those of said molecules of said liquid crystal that are close to said fixed lower member to be anchored to said fixed lower member, and to restrict those of said molecules of said liquid crystal that are not anchored to said fixed lower member to be movable along said upper surface of said fixed lower member.

Claim 11 (previously presented): The object-moving mechanism of claim 9 wherein the sub-means has a pair of rubbed orientation films, one being fitted onto the upper surface of the fixed lower member, the other being fitted onto the lower surface of the movable upper member.

Claim 12 (previously presented): The object-moving mechanism of claim 10 wherein the sub-means has a pair of rubbed orientation films, one being fitted onto the upper surface of the fixed lower member, the other being fitted onto the lower surface of the movable upper member.

Claim 13 (previously presented): The object-moving mechanism of claim 9 wherein the sub-means twists the liquid crystal between the upper surface of the fixed lower member and the lower surface of the movable upper member.

Claim 14 (previously presented): The object-moving mechanism of claim 10 wherein the sub-means twists the liquid crystal between the upper surface of the fixed lower member and the lower surface of the movable upper member.

Claim 15 (withdrawn): An object-moving mechanism comprising:
an outer member which has a space in it;
a shaft which is put in the space for free rotation;
liquid crystal which is put between the inside surface of the outer member and the surface of the shaft; and
a means for applying a radial electric field to the molecules of the liquid crystal to turn them in a plane intersecting the axis of the shaft,

the means including:

 a pair of electrodes, one being fitted to the outer member, the other being fitted to the shaft;

 and

 a sub-means which is fitted onto the outer member and the shaft and restricts the molecules of the liquid crystal so that they will turn in one and the same direction.

Claim 16 (withdrawn): An object-moving mechanism comprising:

 an outer member which has a space in it;

 a shaft which is put in the space for free rotation;

 liquid crystal which is put between the inside surface of the outer member and the surface of the shaft; and

 a means for applying a radial magnetic field to the molecules of the liquid crystal to turn them in a plane intersecting the axis of the shaft,

the means including:

 a pair of magnetic poles, one being fitted to the outer member, the other being fitted to the shaft; and

 a sub-means which is fitted onto the outer member and the shaft and restricts the molecules of the liquid crystal so that they will turn in one and the same direction.

Claim 17 (withdrawn): The object-moving mechanism of claim 15 wherein:

 the sub-means has an orientation film laid on the inside surface of the outer member and an orientation film laid on the surface of the shaft;

 the orientation film of the outer member is rubbed in the direction at an angle with the axis of the shaft; and

 the orientation film of the shaft is rubbed in the direction at an angle with the axis of the shaft.

Claim 18 (withdrawn): The object-moving mechanism of claim 16 wherein:

 the sub-means has an orientation film laid on the inside surface of the outer member and an orientation film laid on the surface of the shaft;

the orientation film of the outer member is rubbed in the direction at an angle with the axis of the shaft; and

the orientation film of the shaft is rubbed in the direction at an angle with the axis of the shaft.

Claim 19 (withdrawn): The object-moving mechanism of claim 15 wherein the sub-means twists the liquid crystal between the inside surface of the outer member and the surface of the shaft.

Claim 20 (withdrawn): The object-moving mechanism of claim 16 wherein the sub-means twists the liquid crystal between the inside surface of the outer member and the surface of the shaft.

Claim 21 (withdrawn): An object-moving mechanism comprising:
an outer member which has an inner space defined by a pair of horizontal upper and lower wall surfaces;
an inner member which is put in the space to divide it into right and left subspaces and movable right and left along the upper and lower wall surfaces;
liquid crystal which is put in the space; and
a means for applying an electric or magnetic field to the molecules of the liquid crystal to turn them in one and the same direction in a plane intersecting the inside of the outer member,
the means including a sub-means for twisting the liquid crystal about an axis intersecting one of the paired wall surfaces and restricting the molecules of the liquid crystal so that those in the right sub-space will turn in one direction and those in the left sub-space will turn in the opposite direction.

Claim 22 (withdrawn): The object-moving mechanism of claim 21 wherein the sub-means has a pair of orientation films, either of the upper and lower wall surface being fitted with one orientation film, the parts of the upper and lower orientation films on the right side of

the inner members being rubbed from the left to the right, the parts of the upper and lower orientation films on the left side of the inner members being rubbed from the right to the left.

Claim 23 (previously presented): The object-moving mechanism of claim 9 wherein:
the means includes a controller to control the timing in applying an electric or magnetic field
to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 24 (previously presented): The object-moving mechanism of claim 10 wherein:
the means includes a controller to control the timing in applying an electric or magnetic field
to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 25 (withdrawn): The object-moving mechanism of claim 15 wherein:
the means includes a controller to control the timing in applying an electric or magnetic field
to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 26 (withdrawn): The object-moving mechanism of claim 16 wherein:
the means includes a controller to control the timing in applying an electric or magnetic field
to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 27 (withdrawn): The object-moving mechanism of claim 21 wherein:
the means includes a controller to control the timing in applying an electric or magnetic field
to the liquid crystal and the intensity of the electric or magnetic field; and
the controller applies an electric or magnetic field to the liquid crystal intermittently.

Claim 28 (currently amended): A method of causing a flow of liquid crystal
comprising the steps of:

putting liquid crystal in a channel defined by at least one wall surface; twisting the liquid crystal about an axis intersecting said at least one wall surface and restricting the molecules of the liquid crystal so that they will turn in one and the same direction by using a twisting/restricting means; and applying an electric or magnetic field to the restricted molecules, the field being in a direction intersecting said at least one wall surface, to turn them by using a field-applying/molecule-turning means; said twisting/restricting means serving to restrict the direction of rotation of those of the molecules which are positioned near said wall surface but not anchored to said wall surface such that, when an electric field or a magnetic is applied and a z-direction is defined as the axial direction of a liquid crystal molecule anchored to said wall surface and projected onto said wall surface, the relative directions of motion from said z-direction of end parts of said molecules rotating around their centers of gravity to move away from said wall surface will coincide with the bulk flow that is generated in said z-direction.

Claim 29 (previously presented): The method of claim 28 of causing a flow of liquid crystal

wherein:

the channel has a pair of wall surfaces facing each other; and the twisting/restricting means has a pair of orientation films, either of the paired wall surfaces being fitted with one orientation film, the paired orientation films being rubbed in one and the same direction.

Claim 30 (previously presented): The method of claim 28 of causing a flow of liquid crystal wherein:

the channel has a pair of wall surfaces facing each other; and the twisting/restricting means has a pair of orientation films, either of the paired wall surfaces being fitted with one orientation film, the rubbing direction of one orientation film is at an angle with the rubbing direction of the other orientation film.

Claim 31 (previously presented): The method of claim 28 of causing a flow of liquid crystal wherein:

the field-applying/molecule-turning means includes a controller to control the timing in applying an electric or magnetic field to the liquid crystal and the intensity of the electric or magnetic field; and

the controller applies an electric or magnetic field to the liquid crystal intermittently.